

**Indicator 20. Percent of Stream Kilometers in Forested Catchments in Which Stream Flow and Timing Have Deviated Significantly from the Historic Range of Variation**

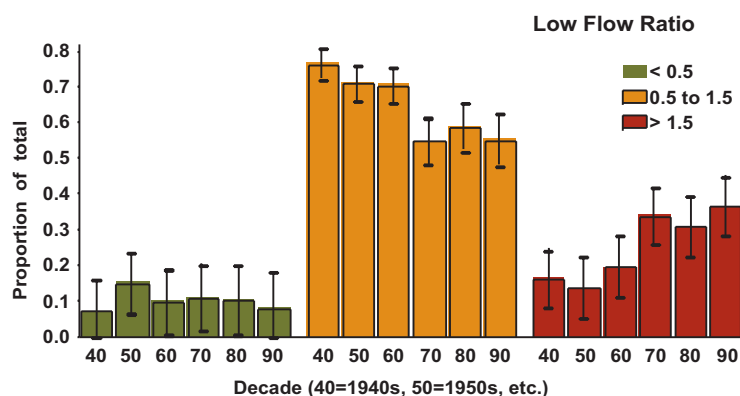


Figure 20-1. Decreased (< 0.5) and increased (> 1.5) ratios of 1940–2000 data over 1870–1939 data indicates decreased and increased minimum flow rates for watersheds. Also apparent is an increase in the number of watersheds with increased minimum flows for 1970–2000.

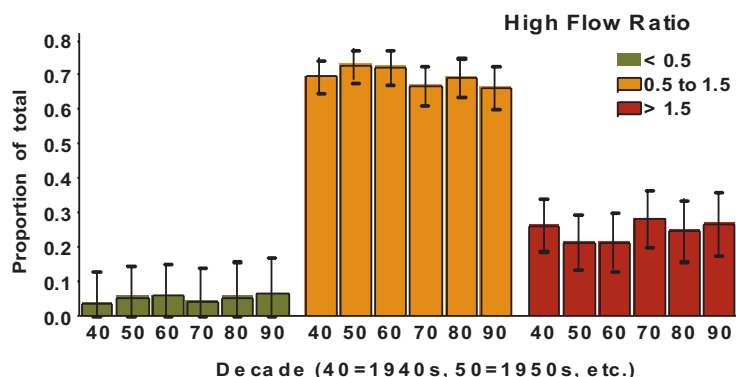


Figure 20-2. Decreased (< 0.5) and increased (> 1.5) ratios of 1940–2000 data over 1870–1939 data indicates decreased and increased maximum flow rates for watersheds. There was no apparent increase in the number of watersheds with decreased or increased maximum flow rates for the period 1970–2000.

**What Is the Indicator and Why Is It Important?**

This indicator measures the effects of forest management and other factors on water flow, including variations in quantity and timing of flow. The timing, magnitude, duration, and spatial distribution of maximum and minimum flow rates must be sufficient to create, and then sustain, aquatic and associated riparian ecosystem habitat to ensure the health and sustainability of those systems, and for the quantity and quality of water for humans. This indicator measures long-term changes in stream or river maximum and minimum flows (most likely resulting from human activities), rather than singular occurrences of flooding or dry periods.

**What Does the Indicator Show?**

More than 20 million waterflow measurements from 1870–2000 were analyzed for 506 of 1960 hydrologic unit code watersheds (HUC-8) in the coterminous 48 States. Maximum flow ratios (95th percentile of annual flow values) and minimum flow ratios (5th percentile of annual flow values) of pre-1940 flow rates were compared with flow rates in subsequent decades. Data from watersheds in 1870–1939 were often sparse and were combined to compare with post-1939 data. That data represents both forest and nonforest area. Ratios greater than 1.5 indicated significant change in maximum and minimum flow rates in 1940–2000 compared to 1870–1939. Ten percent of the watersheds had decreased minimum flow rates and 25 percent had increased minimum flow rates. Similarly, 5 percent of the watersheds had lower maximum flow rates and 25 percent had higher maximum flow rates. Additional analyses of watersheds by decades (1940s, 1950s, etc.) indicated no apparent temporal change in lower or higher maximum flow rates, but did show an increasing change in higher minimum flow rates for the 1970s, 1980s, and 1990s, with about 20 percent of the watersheds showing increased minimum flows in 1940–1969, to about 35 percent of the watersheds with increased minimum flows in 1970–2000. Spatially, most of the increased minimum and maximum flow rates were found in the Eastern United States, and most of the decreased minimum and maximum flow rates were more common in the Central and Western United States.